June 18, 1999

Joint Warfare System (JWARS)

Overview

JWARS Office

Web Site: http://www.dtic.mil/jwars/

e-mail: jwars@osd.pentagon.mil

Agenda

- **Background**
- **Technical Overview**
- **Software Development Process**
- **V&V and T&E**
- **Development Schedule**
- **Participating Organizations**
- **Joint Data Support**

Background

Joint Analytic Modeling -- High Profile Studies

Planning / Programming	Modernization Assessments	Operational Assessments
• Base Force	• Heavy Bomber/ B-2 Study	• Desert Storm
• BUR Force	• JAST	• Vigilant Warrior
• MRS BURU	• DAWMS	• CINC Force Allocation
• NIMBLE DANCER		• Bosnia Alternatives
• JWCA		
• 1997 QDR		

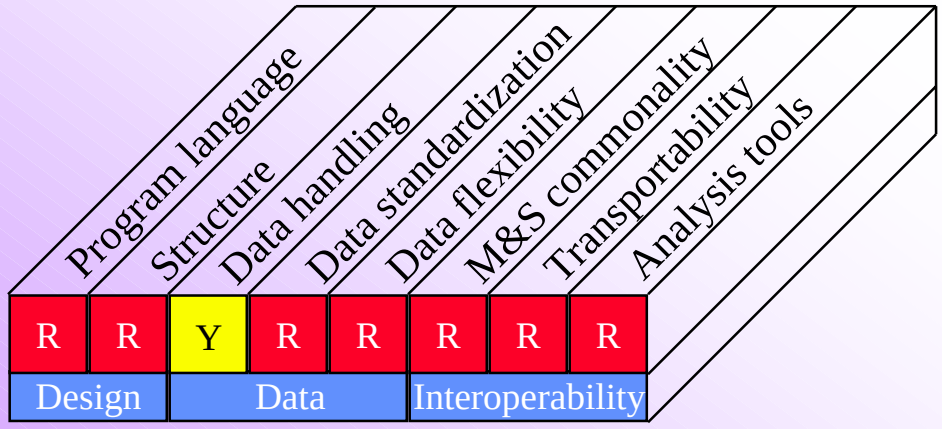
But current simulation capabilities are limited in key functional areas.

If JWARS had been available, it would have benefited 1997 QDR.

Inventory of Current Models Used to Support Joint Analysis

Model Name	Vintage	Users	Land	Air	Naval
TACWAR Base Force ** BUR ** MRS BURU Nimble Dancer (ND) ** Desert Storm	1960s	CINCs Joint Staff OSD/PA&E	✓	✓	
THUNDER USAF Analyses ** Nimble Dancer ** JAST	1980s	Air Force	✓	✓	
CEM Army Analyses ** TAA	1960s	Army	✓	✓	
ITEM Navy Analyses ** ND ** Invest Balance Review	1980s	Navy		✓	✓

Many weaknesses are caused by limitations in technical capabilities



✓ **denotes emphasis**

Limitations of Current Theater-Level Simulations

Joint	Joint warfare	Y
Ground	Ground engagement	Y
	Maneuver	R
Air	Air superiority	Y
	Air and missile defense	Y
	Strategic air role	R
	Strike	R
Naval	Surface warfare	Y
	Anti-submarine warfare	Y
	Mine warfare	Y
	Amphibious operations	R
Control & BDA	C3	R
	ISR	R
Support	Deployment/sealift	G
	Logistics CS/CSS	R
Other	WMD	R
	Special operations	R

Key

- Adequately — G
- Somewhat — Y
- Poorly or Not at all — R
- Using adjunct Analysis

Source
JAMIP working group, Spring 1995

Note: Space and information warfare were rolled into other categories when this study was conducted.

Solution

Feb 95 - DepSecDef directed the Director, PA&E, with participation from the Assistant Secretary of Defense (Strategy and Requirements) and the Joint Staff, to

- Initiate a phased program to upgrade existing joint analytic models and simulations (near term) and develop a set of next generation models (longer term).
- Identify an approach and management structure.

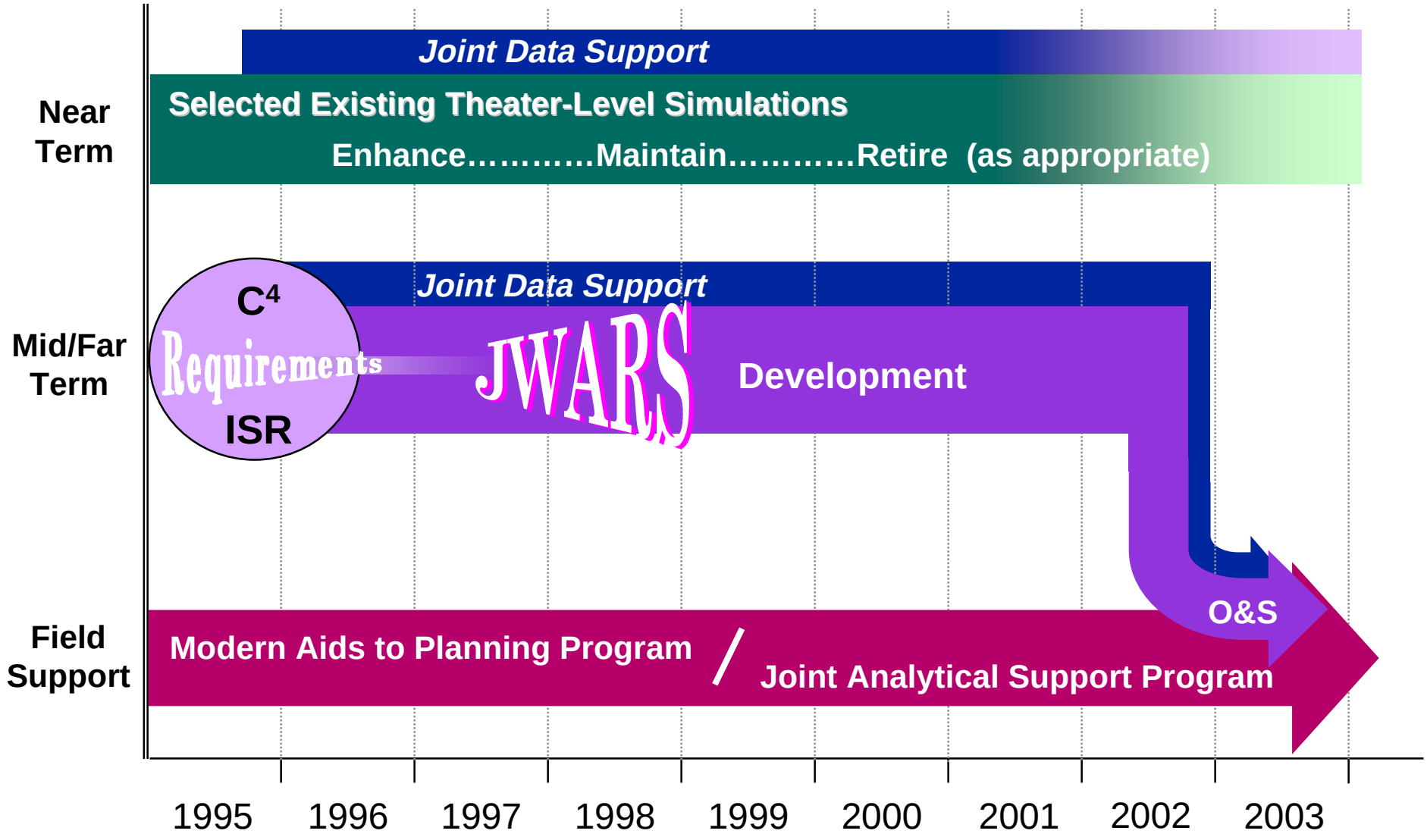
May 95 - DepSecDef approved the Joint Analytic Model Improvement Program (JAMIP) and directed PA&E in cooperation with the Joint Staff to

- Set up the Joint Warfare System (JWARS) Office.
- Establish manpower and support for the JWARS Office with assistance from the Services.
- Develop a funding plan.

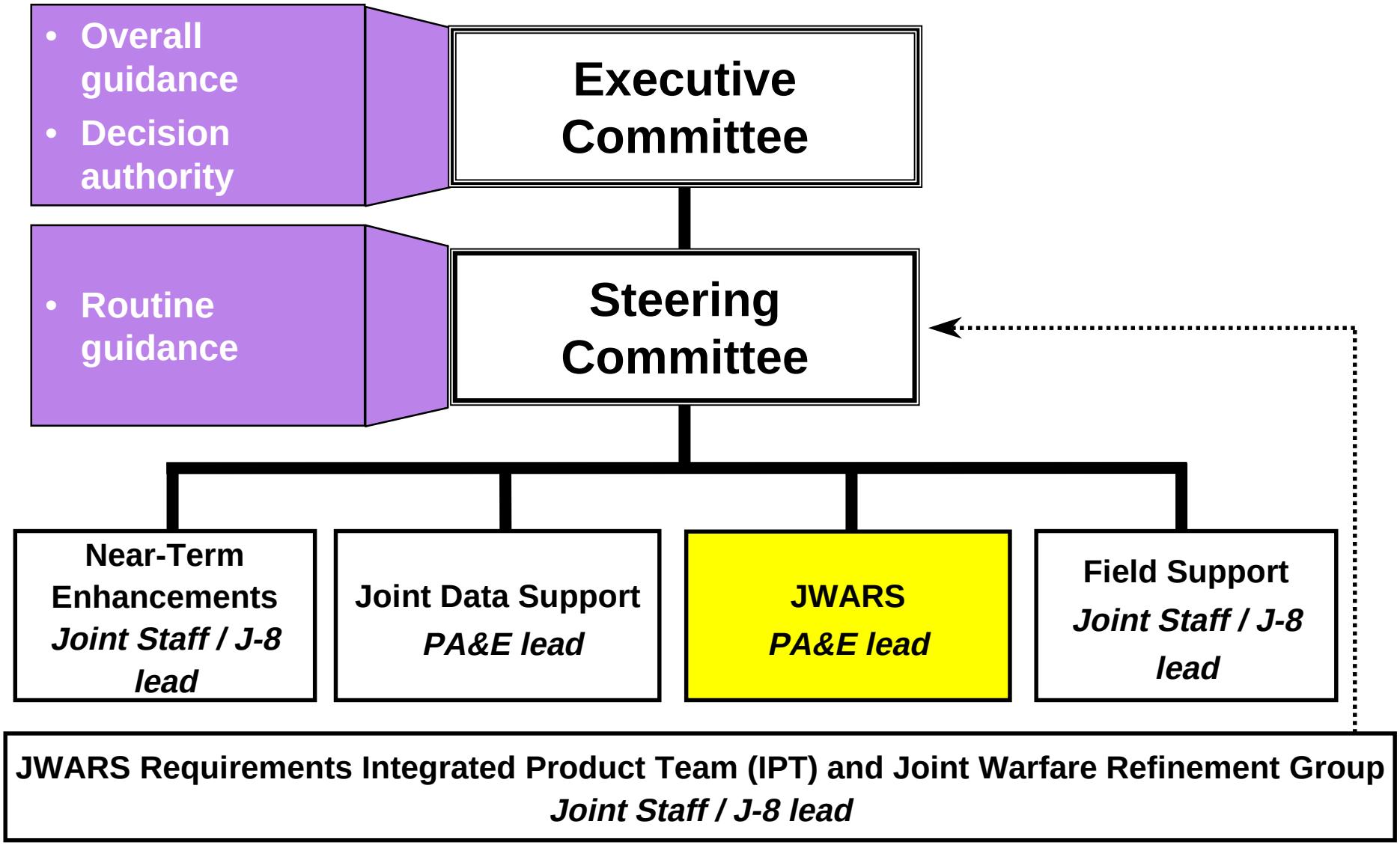
Nov 95 - DepSecDef formally established JWARS Office.

Jun 96 - DepSecDef designated OSD/PA&E (Joint Data Support) as primary data support agency for JAMIP.

Joint Analytic Model Improvement Program (JAMIP)



JAMIP Organization and Management Structure



Mission

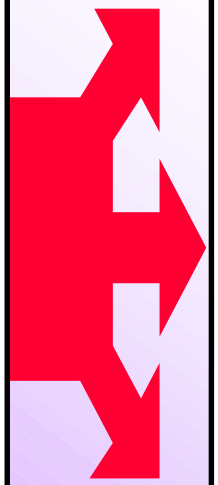
Mission: Develop a state-of-the-art, constructive simulation that will:

- **Provide a multi-sided and balanced representation of joint theater warfare**
- **Be able to assess current and future operational concepts to include JV 2010's:**

  Dominant Maneuver, Precision Engagement, Focused Logistics, and Full-Dimension Protection
- **Use C4 and ISR as the foundation for how entities perceive and interact with one another**

Users

- **Joint Staff**
- **Services**
- **CINCs**
- **OSD**
- **Joint Task Forces**
- **Other DoD org's**
- **Industry**



Applications

1. **Force assessment**
2. **Planning and execution**
   - **Deliberate planning**
   - **Crisis action planning**
3. **System effectiveness and trade off analysis**
4. **Concept and doctrine development and assessment**

Requirements

- **Operational Requirements Document (ORD) was prepared by JWARS Requirements Team led by Joint Staff / J-8.**
- **Warfare functionality requirements were refined by Joint Warfare Refinement Group.**
- **ORD was approved by Joint Requirements Oversight Council (JROC) in August 1998.**

Key Performance Parameters (KPPs)

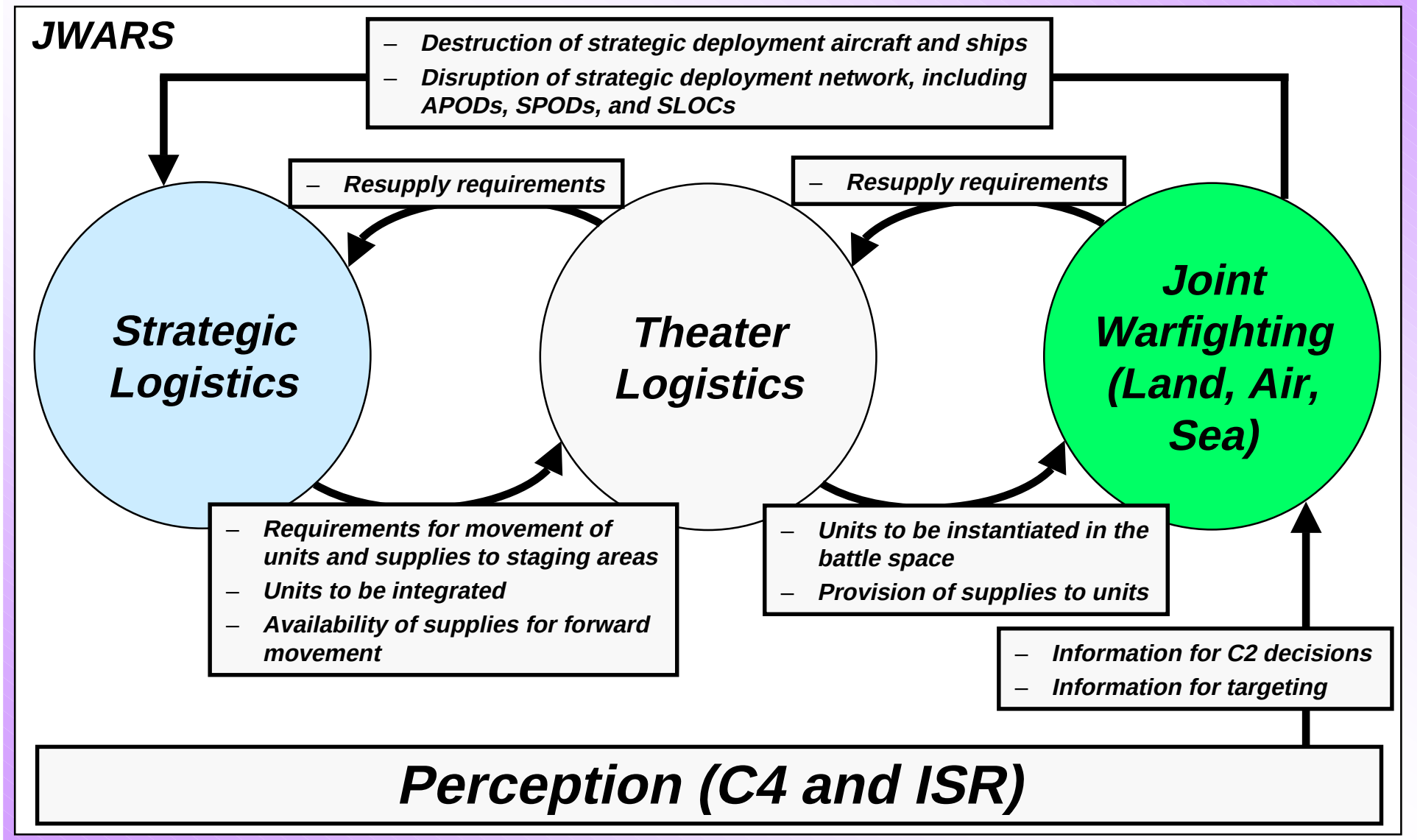
- **Traceability**
  - **Cause and effect relationships**
  - **Tracking of data sources**
- **Verification and validation (V&V)**
  - **Correct representation of doctrine, performance, and environment**
  - **Balance across joint warfare functions**
- **Utility**
  - **Study execution**
    - ⇨ **Includes *warfare functionality***
  - **Deterministic and stochastic modes**
  - **Multiple levels of resolution**
  - **Execution speed**

Warfare Functionality

(slide 1 of 2)

- **Release 1 (Limited IOC)**
  - **Include C4, ISR, logistics, and essential functionality in legacy simulations TACWAR and MIDAS.**
  - **Be capable of replacing TACWAR for force assessment application.**
- **Release 2 (Full IOC)**
  - **Provide balanced warfare representation, including C4, ISR, logistics.**
  - **Be capable of supporting the applications--**
    1. **Force assessment.**
    2. **Planning and execution.**
  - **Be capable of replacing TACWAR and MIDAS.**
- **Release 3 (FOC)**
  - **Provide balanced warfare representation, including C4, ISR, logistics.**
  - **Be capable of supporting the applications--**
    1. **Force assessment.**
    2. **Planning and execution.**
    3. **System effectiveness and trade-off analysis.**
    4. **Concept and doctrine development and assessment.**
  - **Be capable of replacing legacy simulations CEM, Thunder, ITEM, and SUMMITS.**

Warfare Functionality
(slide 2 of 2)



Note: More information on *warfare functionality* is provided later under "Development Schedule."

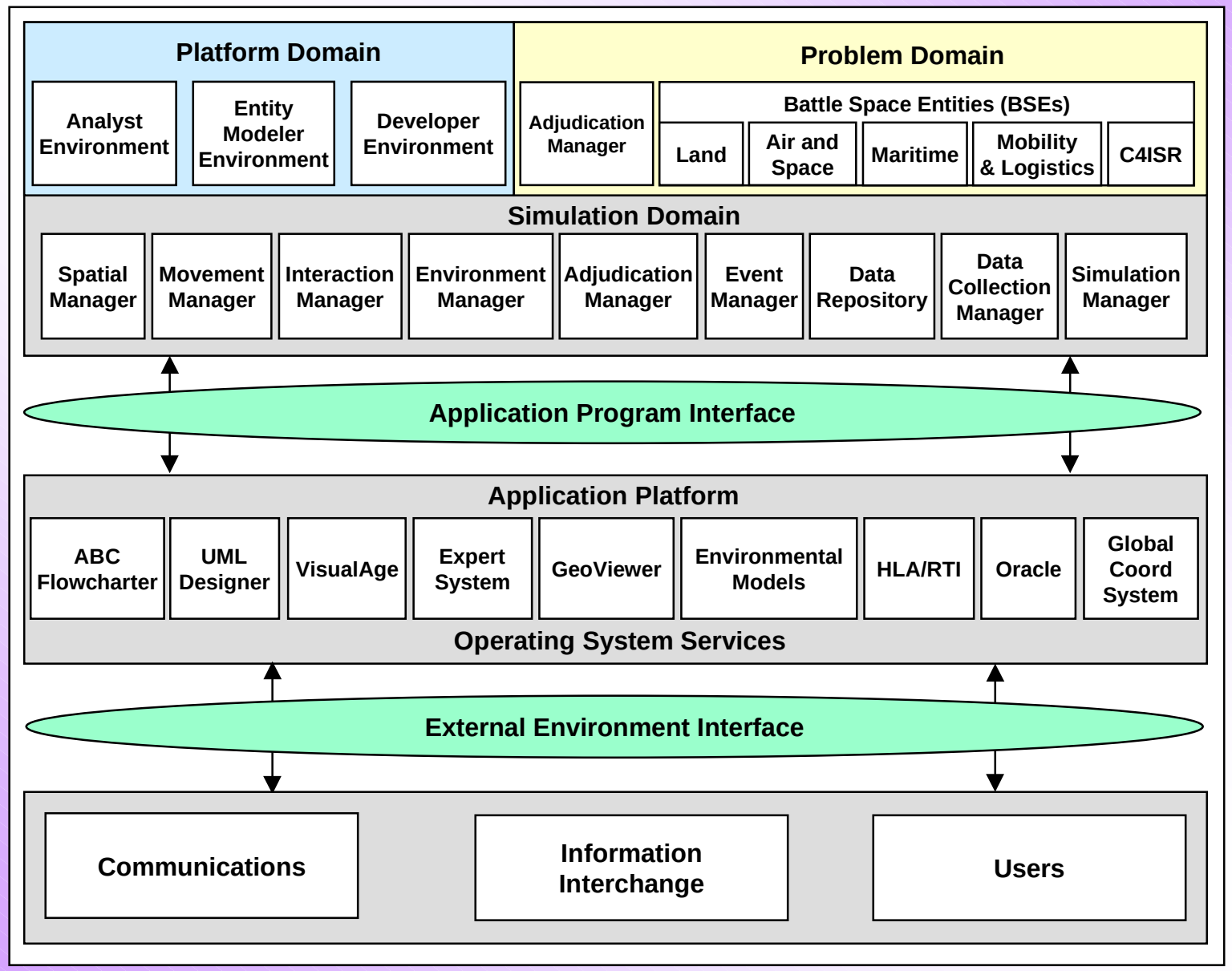
Execution Speed

- **Interpretation: ratio of simulation speed to clock speed for a deterministic use or one replication of a stochastic use**
- **Threshold for Releases 1 and 2 — 1,000:1**
- **Threshold for Release 3**
  1. **Planning and execution — 1,000:1**
  2. **Force assessment — 1,000:1**
  3. **System effectiveness and trade off analysis — 500:1**
  4. **Concept and doctrine development and assessment — 500:1**

Technical Overview

JWARS Architecture

Joint Technical Architecture (JTA) View



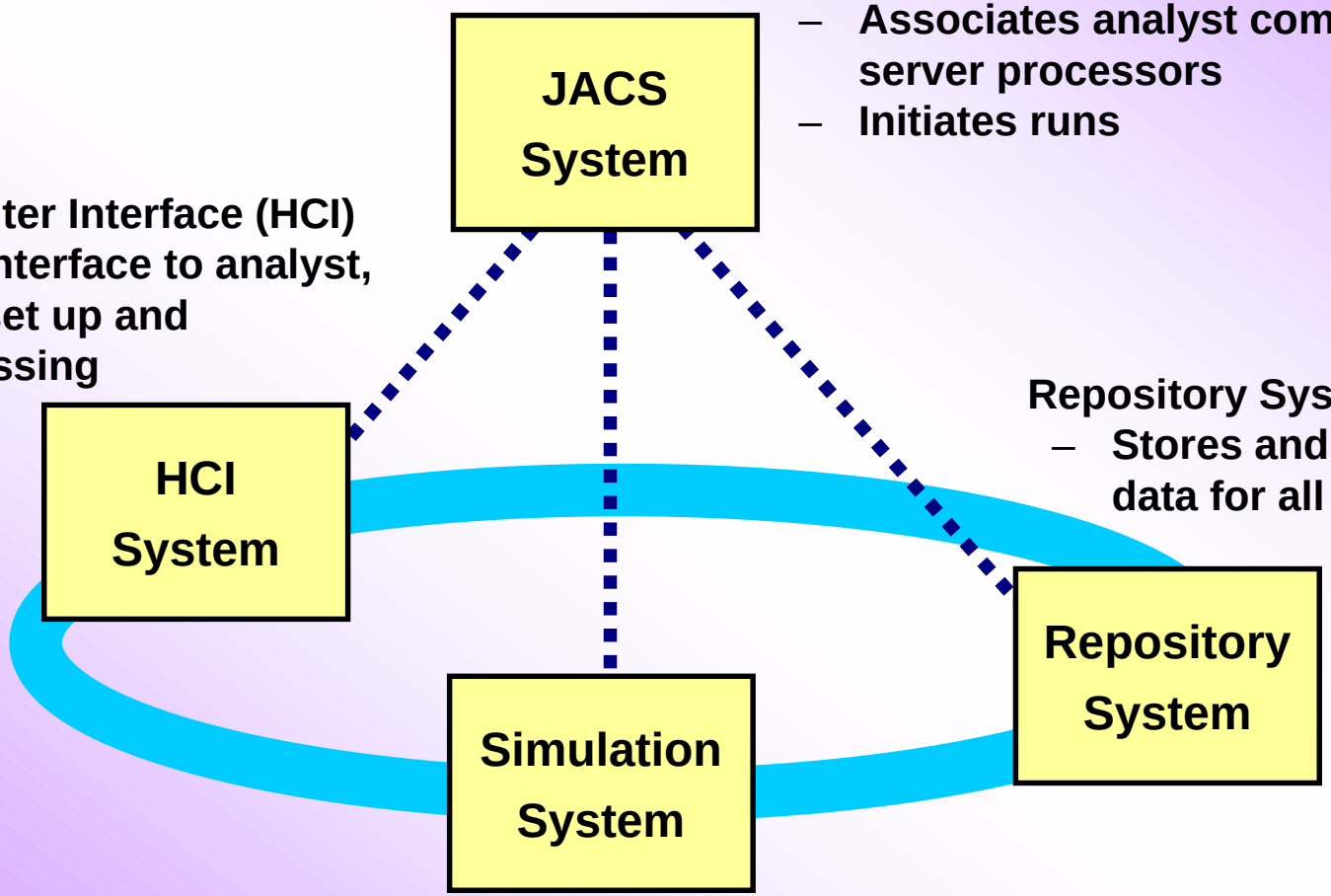
Domain Descriptions

- **Platform Domain**
  - **Interface to users (analysts, entity modelers, and developers)**
- **Problem Domain**
  - **Units and weapon systems interacting in the battle space**
  - **Activities: C2, shoot, move, communicate, sustain, ...**
- **Simulation Domain**
  - **Supporting components that allow the Problem Domain to simulate activities and report results**

Distributed System Design (Process View)

JWARS Admin Control System (JACS)
- **Associates analyst computer to server processors**
- **Initiates runs**

Human Computer Interface (HCI)
- **Provides interface to analyst, for study set up and postprocessing**



Repository System
- **Stores and manages data for all runs**

Performs simulation runs

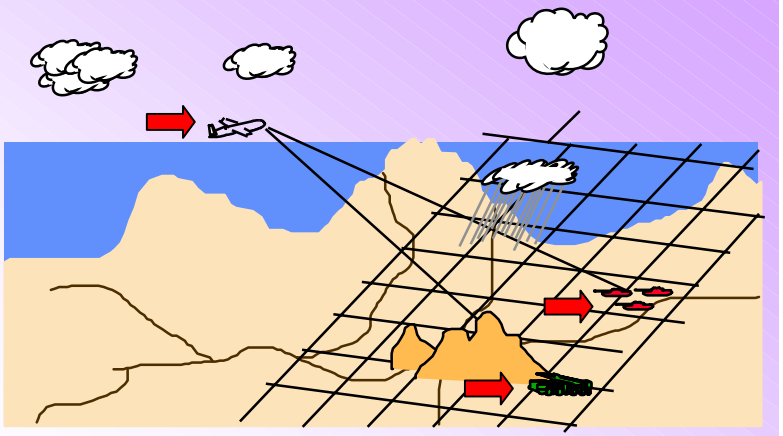
JWARS Users: Three Levels

- **Analyst**
  - Creates scenarios by selecting from a list of real-world entity representations
  - Does not modify entity parameters
  - Limited to views of existing entities
- **Entity Modeler**
  - Composes entities from objects
  - Does no coding
  - Infrastructure protects Entity Modeler from making inappropriate combinations of objects
  - Implements new scenarios by creating new entities
- **Developer**
  - Access to source code
  - Writes restrictions governing the combinations of objects and entities
  - Receives Entity Modeler's requirements, completes design, codes and stores in Object Class Library

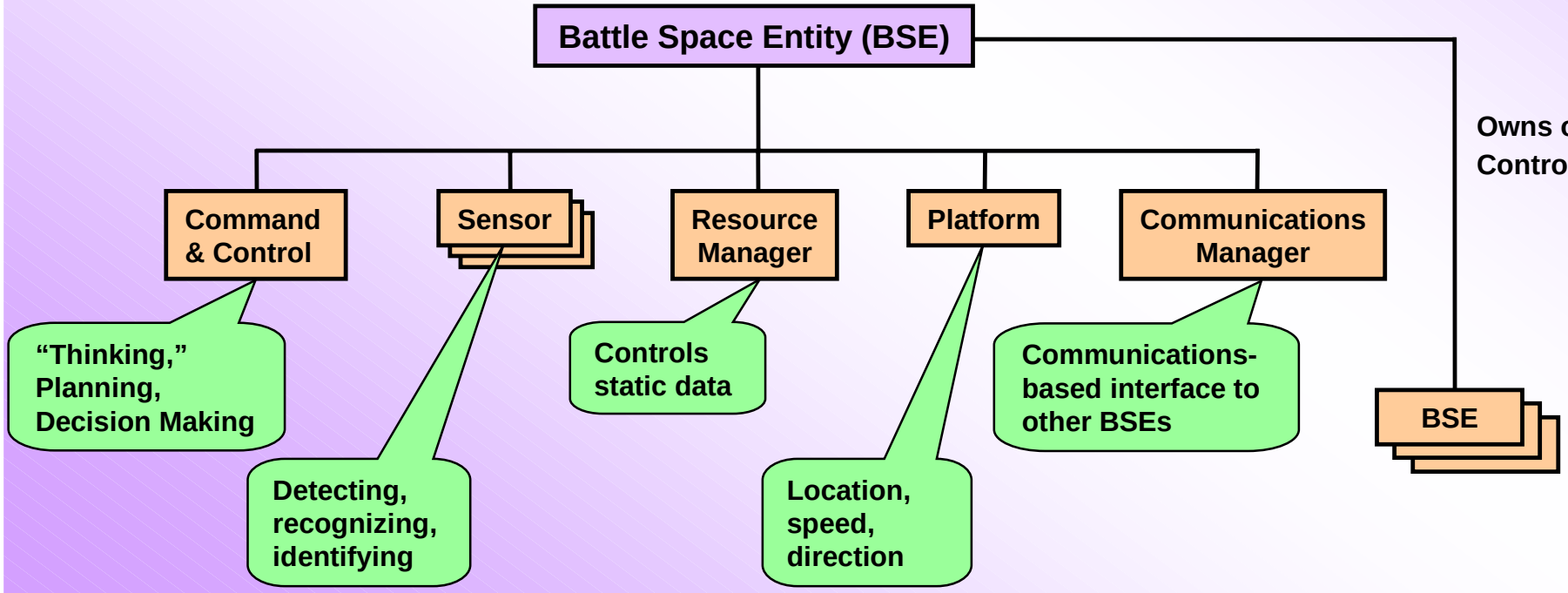
Approach enables JWARS to meet requirement to represent current and future military operations.

Fundamental Problem Domain Component -- Battle Space Entity (BSE)

- **BSE -- friendly unit, enemy unit, or major system operating in the battle space**



- **Top-level decomposition**



Major BSE Types

Coalition Headquarters

Coalition Component Headquarters

Operational Headquarters
- Army Corps, Division, or Brigade
- USMC MEF Forward
- Air Expeditionary Force
- Air Flight Group
- Carrier Battle Group
- Surface Warfare Commander
- Surface Action Group

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Mobility Forces
- Strategic Mobility Aircraft
- Strategic Mobility Ship

Operating Forces
- Land: Maneuver Battalion
- Air: Air Mission Element
- Space: Sensor Satellite
- Maritime: Ship, Submarine

Support Forces
- Ground Combat Support and Combat Service Support Organization
- Airbase Support Organization

Stationary Entities
- Air Installation
- Seaport Installation
- Depot

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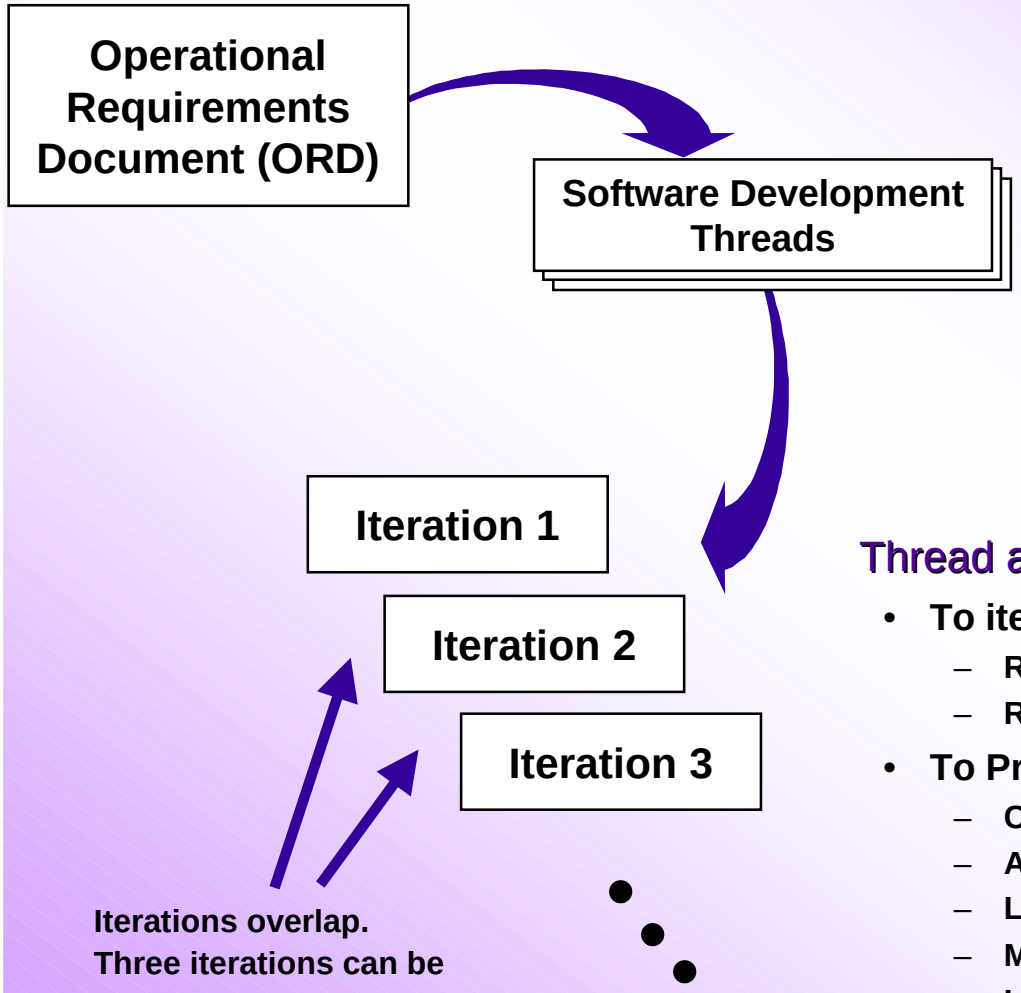
Simulation Domain Components

Manager	Function
Spatial Mgr	Geo-spatial filter that minimizes battle space interactions
Movement Mgr	Controls movement of BSEs
Interaction Mgr	Informs BSEs when they might “see” each other
Environment Mgr	Informs BSEs about the physical environment in which they operate
Adjudication Mgr	Assesses results of combat
Event Mgr	Manages time and activities
Data Repository	Manages storage of persistent data
Data Collection Mgr	Collects data during simulation
Simulation Mgr	Ties all software components into single simulation

Software Development Process

Warfare Functionality Development Process
(slide 1 of 2)



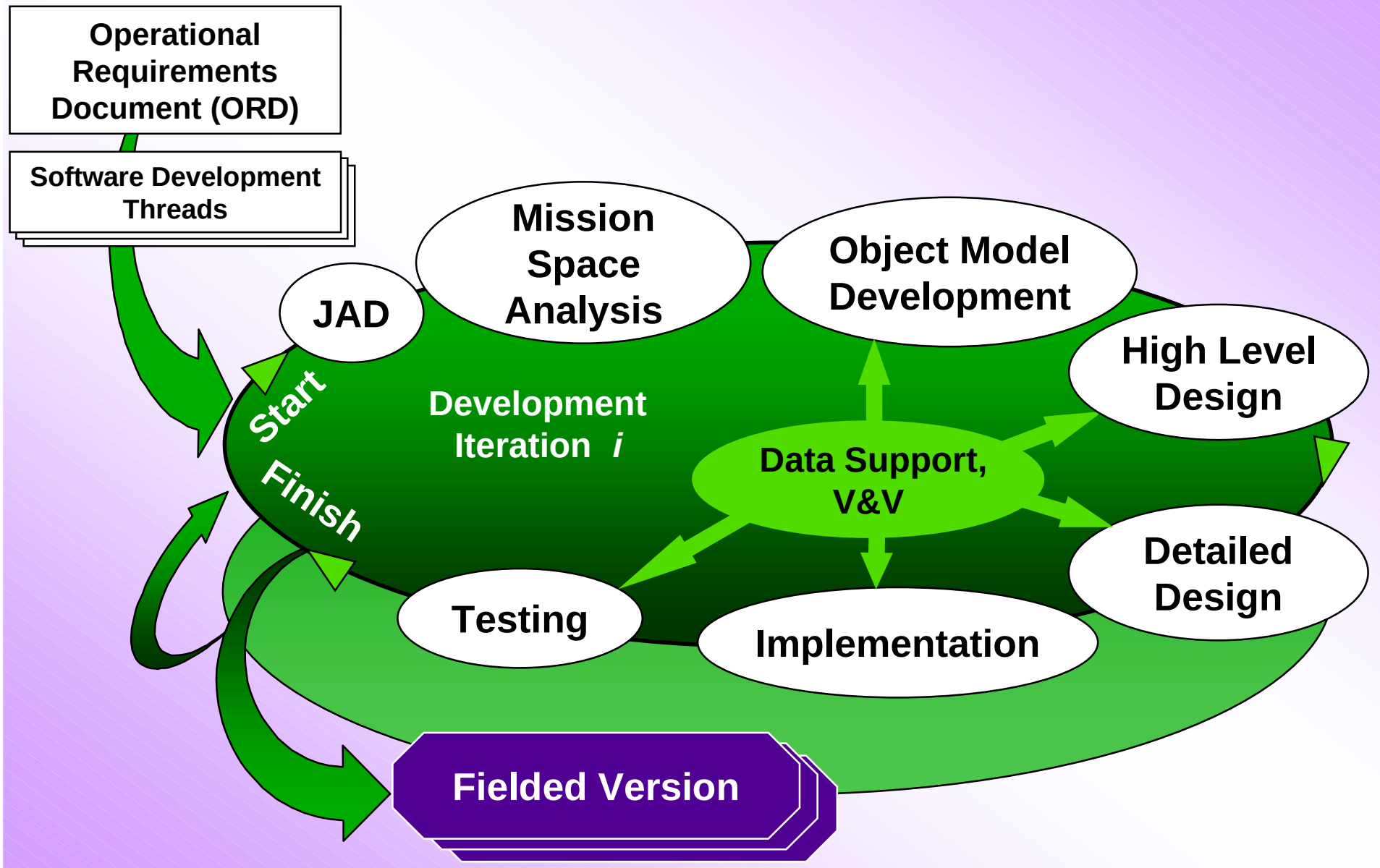
Threads

- Refine warfare functionality
- Functional area-related
- Resource-constrained
- ORD Release 1 threshold: *51 threads*
- ORD Release 2 threshold: *72½ threads*
- Example thread:
  "Conduct Defensive Land Operations"

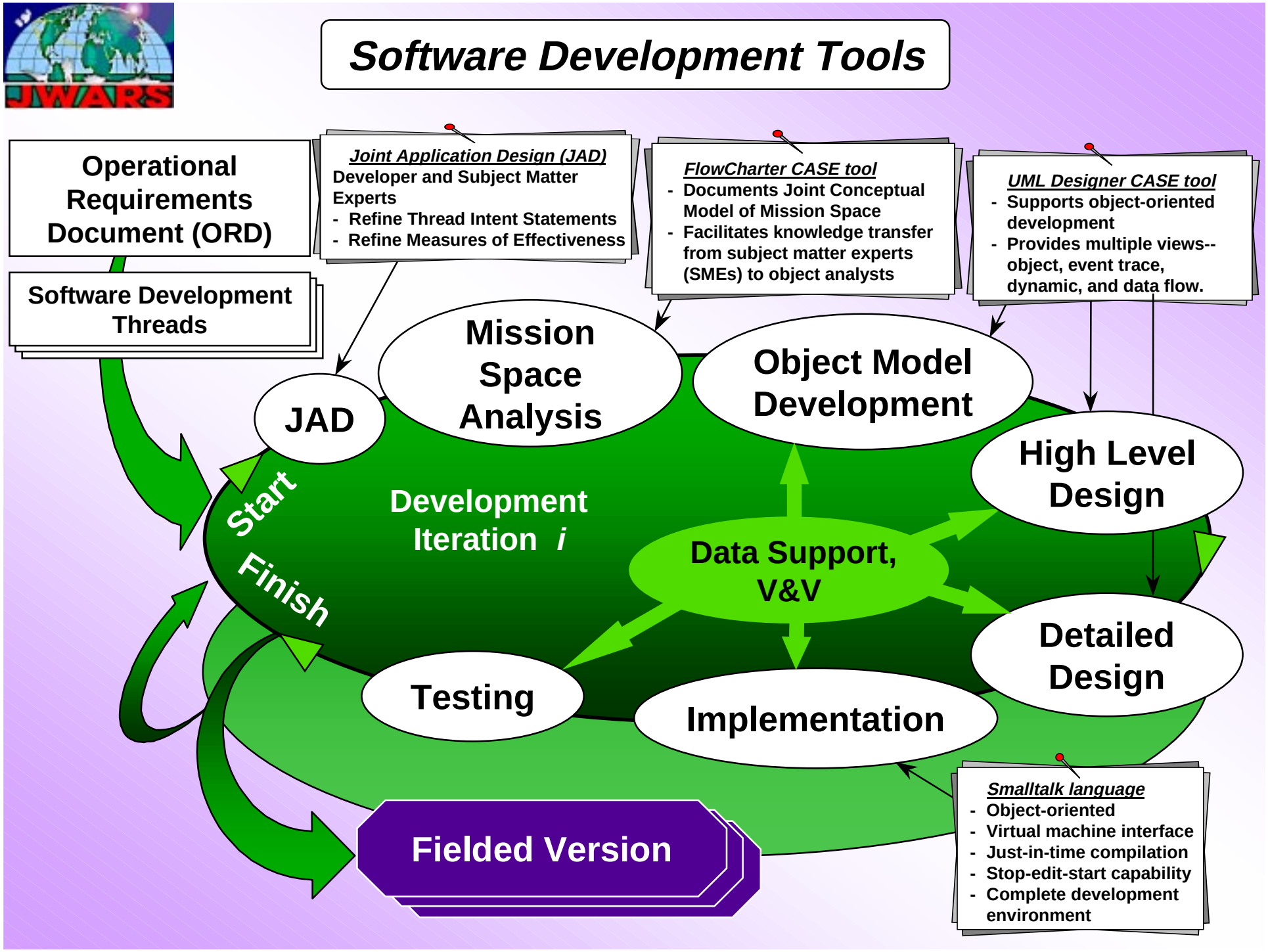
Thread assignments

- To iterations
  - Release 1: 5 iterations
  - Release 2: 3 additional iterations
- To Problem Domain Integrated Product Teams (IPTs)
  - C4ISR
  - Air and Space
  - Land
  - Maritime
  - Logistics
- Generally 2 threads / IPT / iteration

Warfare Functionality Development Process
(slide 2 of 2)



Software Development Tools



Verification and Validation (V&V)

and

Test and Evaluation (T&E)

JWARS V&V and T&E

Verification and Validation (V&V)

- **Activities (described later) performed during development by JWARS V&V Agent, users, and subject matter experts**
- **Documented by JWARS V&V Agent**

Test and Evaluation (T&E)

- **Internal testing - by development contractor for JWARS Office**
  - **Thread testing - after each development iteration**
  - **Acceptance testing - prior to each formal release**
- **External testing - by selected user sites, at each formal release**
  - **Beta testing**
  - **Operational Test and Evaluation (OT&E)**

V&V and T&E Definitions

Verification: The process of determining that a model implementation accurately represents the developer's conceptual description and specifications

(Source: DoD Instruction 5000.61, DoD Modeling and Simulation)

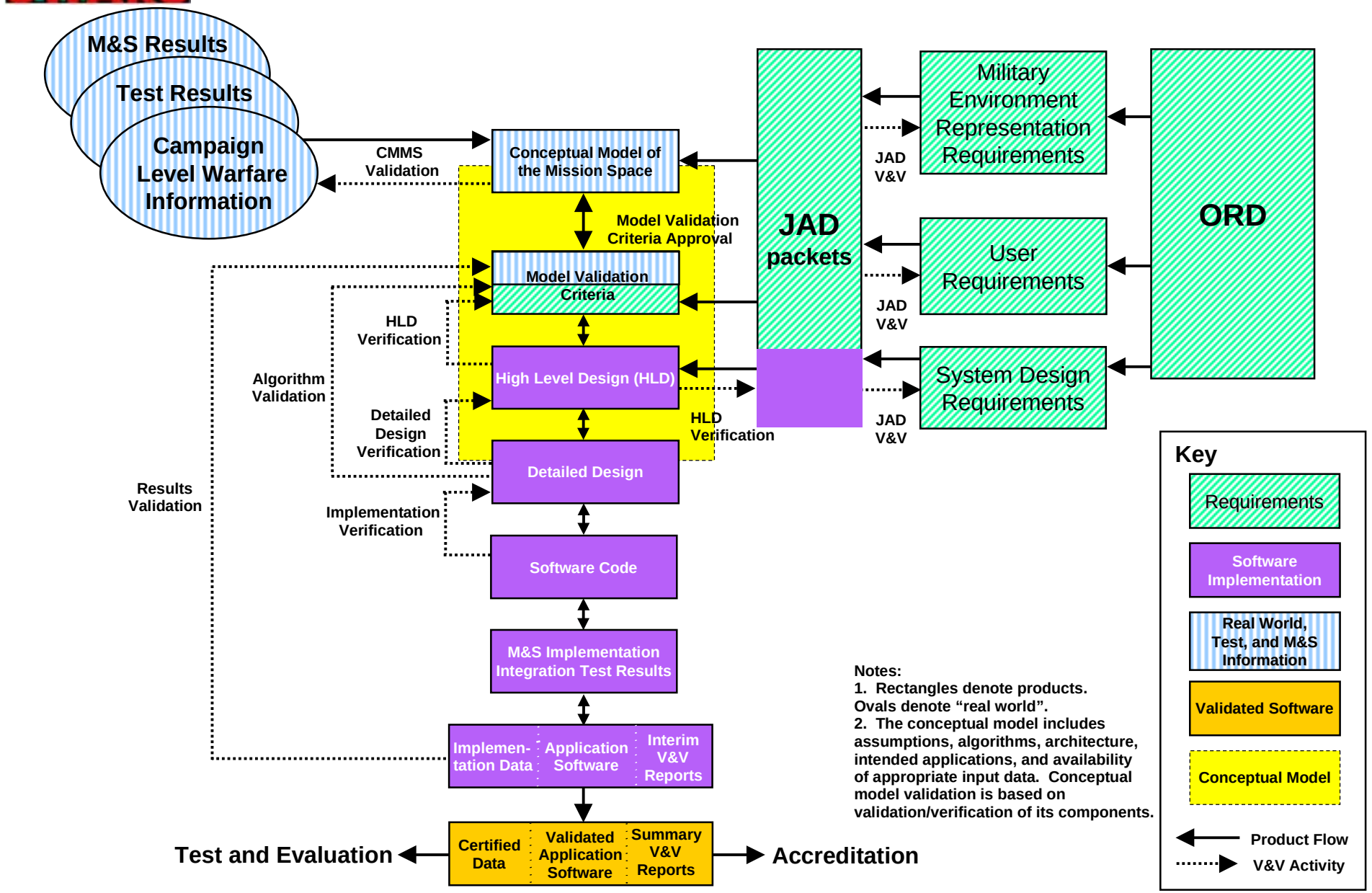
Validation: The process of determining the degree to which a model is an accurate representation of the real world from the perspective of the intended uses of the model

(Source: DoD Instruction 5000.61, DoD Modeling and Simulation)

Operational Test and Evaluation (OT&E): "Determine whether systems are operationally effective and suitable for the intended use by representative users before production or development"

(Source: Draft DoD Regulation 5002.2R, Appendix III)

Integrated Software Development and V&V Process



Release 1 Test and Evaluation

Objective

- **Ensure that ORD requirements are satisfied**

Process

- **Installation and training for user test sites**
- **Beta testing by user test sites**
- **Operational testing by user test sites, overseen by Services' Operational Test Agencies (Army lead)**

Participating user sites

ODPA&E (SAC)	**JS (J-8)**	**USAF (AFSAA)**	**USA (CAA)**
USN (N81)	**USMC (MCCDC)**	**USCENTCOM**	**USSOCOM**
USTRANSCOM	**USPACOM**	**USFK**	

Schedule

- **September 1999 - March 2000**

Release 1 Training Curriculum

Sun Mon Tues Wed Thurs Fri Sat

Student travel

Basic Course

- **JWARS Overview**
- **JWARS Testing**
- **JWARS Design**
- **JWARS Functionality**
- **JWARS Demo**
- **HCI Training**
  - **Overview**
  - **Running Simulation & Excursions**
  - **Reporting**
- **Joint Data Support**

2 days

Advanced Course

- **JWARS Update -- Alpha to Release 1**
- **Using JWARS Release 1**
  - **Study Development**
  - **Scenario Development**
    - **Battle Space Entities**
    - **Excursions -- Operational & Data**
  - **Simulation Options / Controlling the Simulation**
  - **Reports and Output Processing**
- **Additional Training Periods**
- **JWARS Analysis**
- **JWARS Architecture**
- **JWARS Design -- Algorithms**
- **JWARS Diagnostics**

3 days

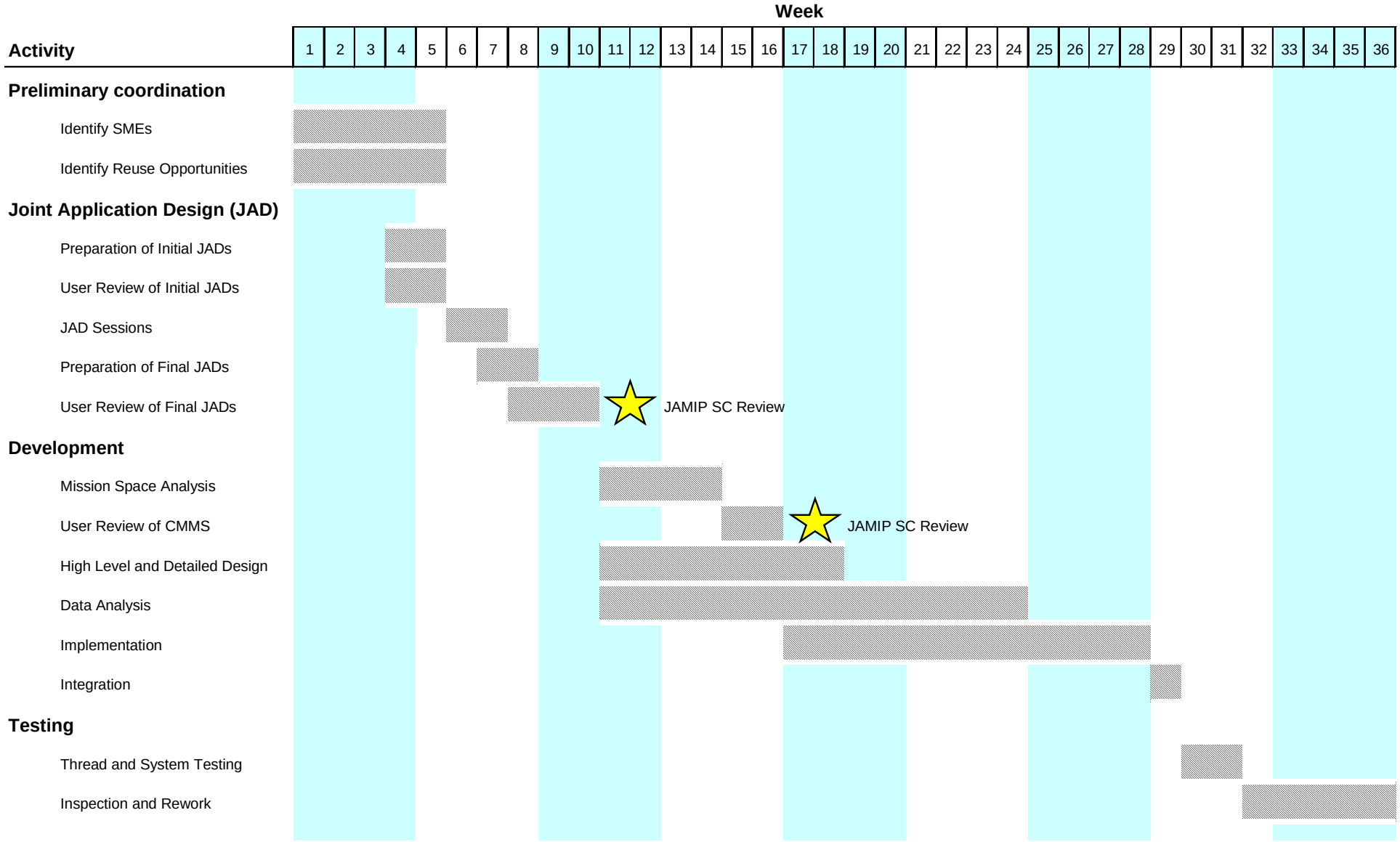
Student travel

V&V and T&E Documentation

V&V	**V&V Plan**
	Joint Application Design (JAD) V&V Reports
	Model Validation Criteria
	CMMS Validation Reports
	High Level Design (HLD) Verification Reports
	Detailed Design Verification Reports
	Algorithm Validation Reports
	Implementation Verification Reports
	Results Validation Reports
T&E	**Test and Evaluation Plan (TEP)**
	Thread Test Reports
	Acceptance Test Reports
	System Evaluation Plan (SEP)
	Event Design Plan (EDP)
	Operational Test and Evaluation (OT&E) Report

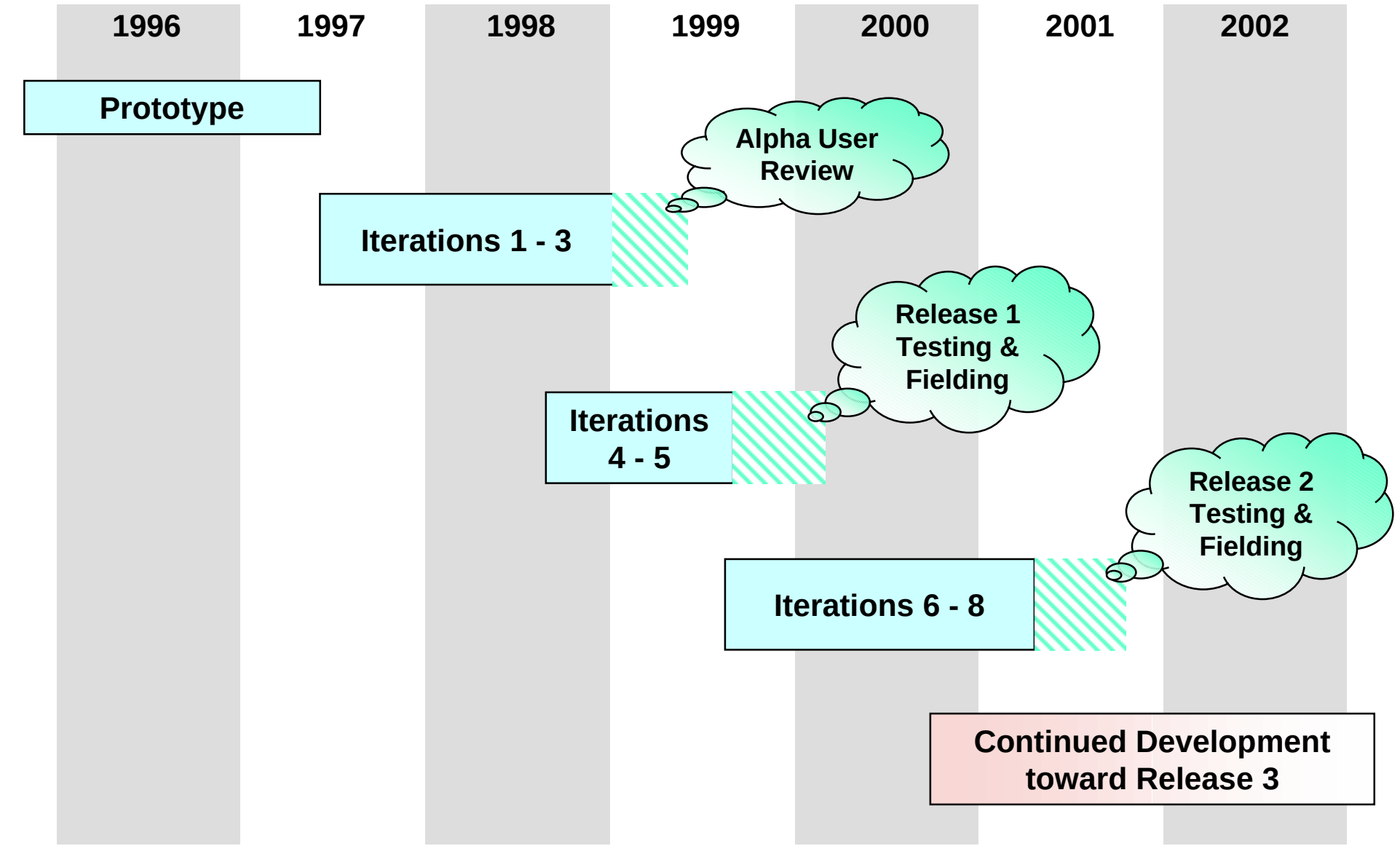
Development Schedule

JWARS Development Review Process - One Iteration *

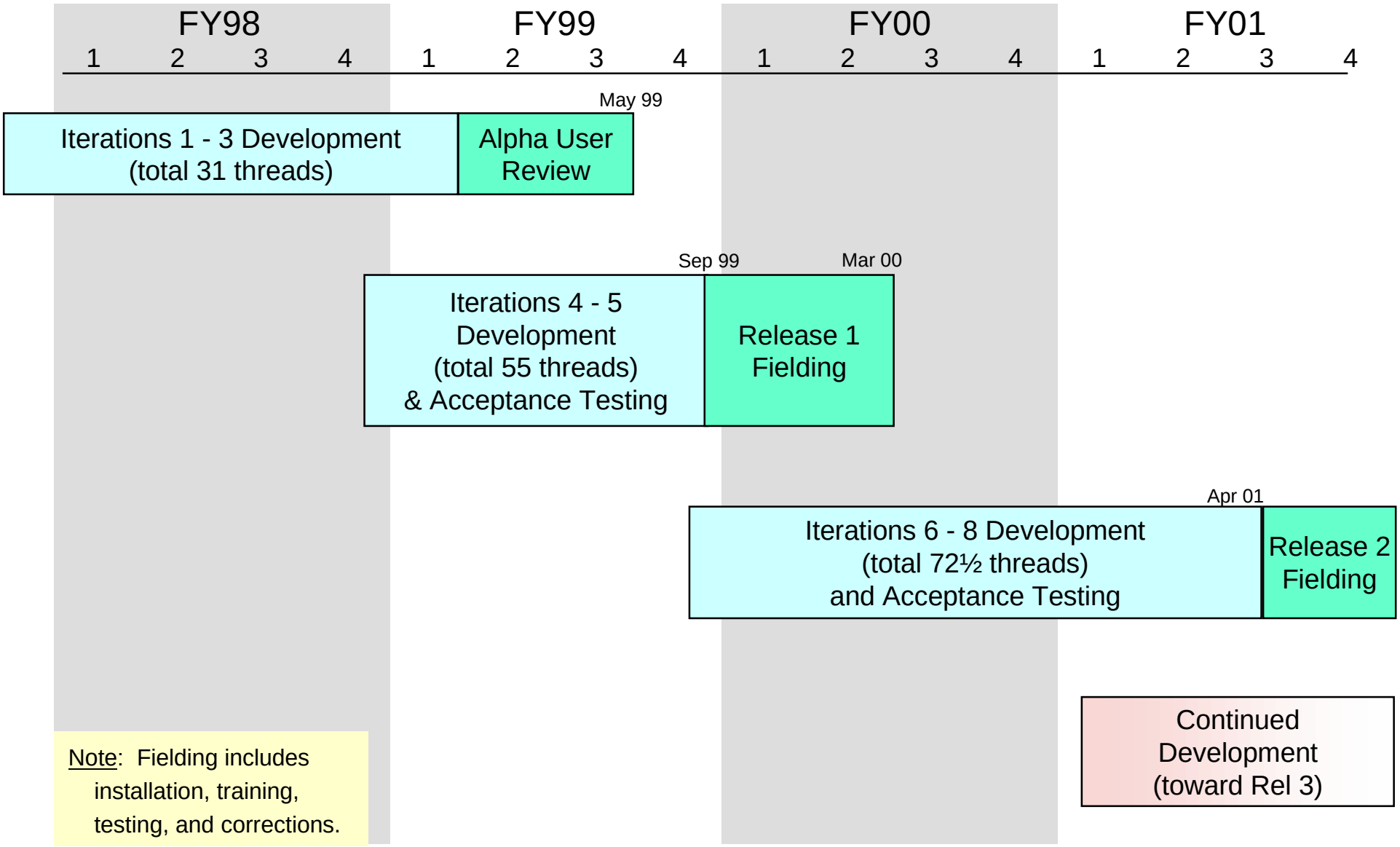


*** Iterations overlap. Three iterations can be completed per year.**

JWARS Development Schedule -- Overall



JWARS Development Schedule -- Current



Warfare Functionality - Release 1 (Limited IOC)

*(55 Threads *)*

Major module	Functionality	Release 1 content
Strategic Logistics	Strategic flow from POE to POD	√
	Strategic network	√
	Air and sea PODs	basic [1]
Theater Logistics	Integrate units into theater	√
	Intratheater network	√
	Logistics distribution	√
Perception	Provide intelligence information	√
	Assess operational situation	√
	Communicate	√
Operations	Command and control	√ (theater, land, air, maritime)
	Air Tasking Order	√ [2]
	Interdiction and counter air	basic [2]
	Maritime warfare	SUW, USW, blockade [3]
	Land warfare	basic [4]
	Firepower and close air support	√
	Theater ballistic missile defense	basic [2]
	Suppression of enemy air defense	√
	Chemical defense	√
	Forcible entry	√

Notes:
1. More detailed representations of APOD and SPOD operations will be incorporated in Release 2.
2. Representations of Integrated Aerospace Defense and Airspace Control remain to be incorporated in Release 2.
3. Countermine operations remain to be incorporated in Release 2.
4. Mobility/countermobility operations remain to be incorporated in Release 2.

* Exceeds Release 1 threshold in ORD

Warfare Functionality - Release 2 (Full IOC)
*(72½ Threads *)*

Warfare functionality (expressed as enhancements to 55 threads)

- **Strategic Logistics -- MIDAS(+)**
  - **Improved APOD and SPOD representations**
  - **Logistics C2**
- **Theater Logistics -- Links strategic logistics to theater operations**
  - **Restore unit combat capability**
  - **Allocate sustainment stocks**
  - **Operational service support**
  - **Intratheater aerial refueling**
- **Perception -- ISR**
  - **Completed at Release 1**
- **Operations -- TACWAR(+)**
  - **Operational mobility/counter mobility -- land and sea**
  - **Integrated aerospace defense, and airspace control**
  - **Raids -- land-based and amphibious**
  - **Effects of attacks on strategic targets**
  - **Electronic attack**

* **Release 2 threshold in ORD**

Warfare Functionality - Release 2 Objective
(96 Threads)*

Content (expressed as enhancements to 72½ threads)

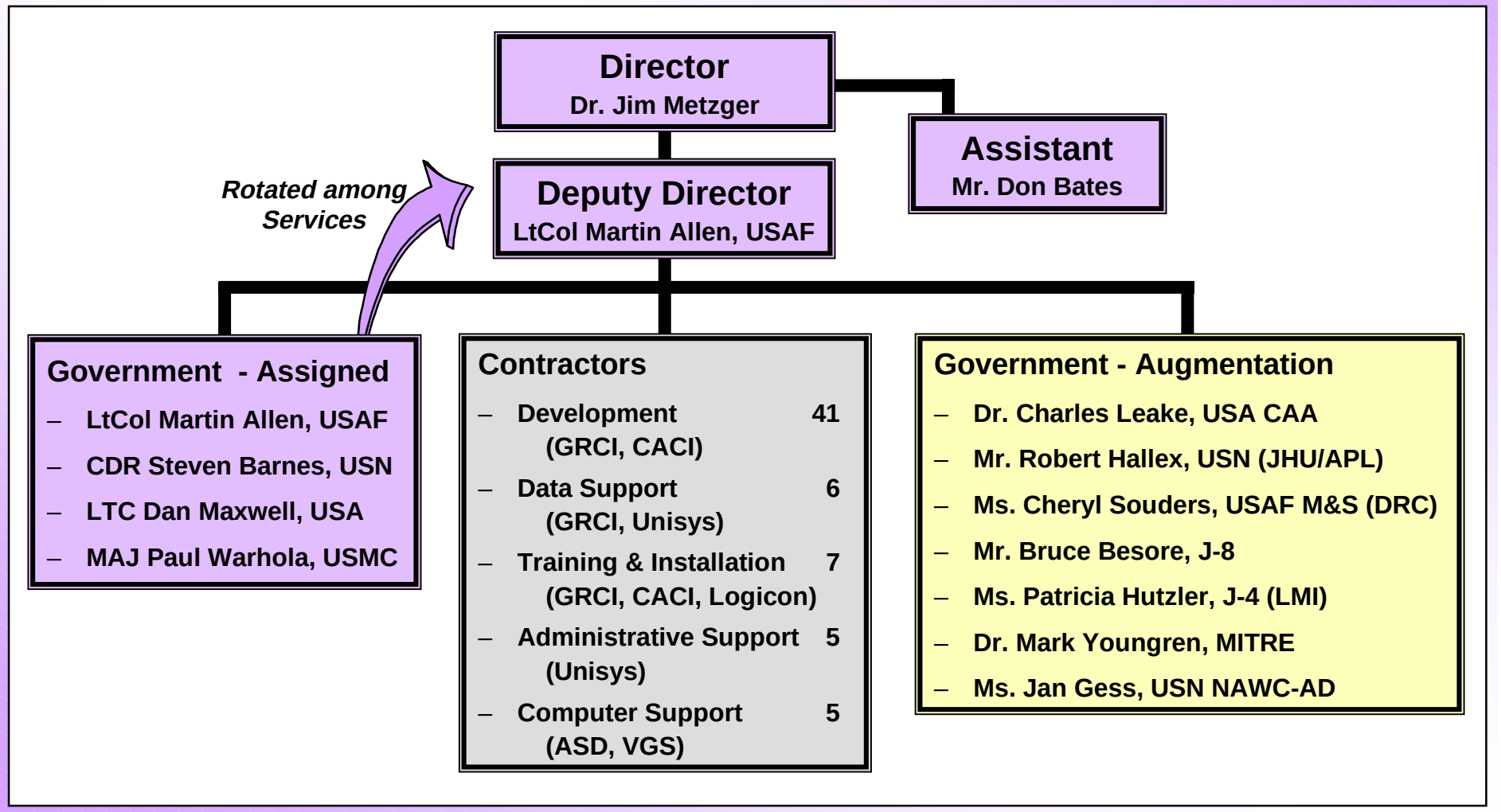
- **Strategic Logistics -- MIDAS(+)**
  - **Detailed representation of Voluntary Intermodal Sealift Agreement**
  - **Detailed representation of fuel during strategic deployment**
  - **Theater backhaul of personnel and equipment**
- **Theater Logistics -- Links strategic logistics to theater operations**
  - **Host Nation Support and non-combatant support**
- **Perception -- ISR**
  - **Dynamic retasking of sensors (within ATO)**
- **Operations -- TACWAR(+)**
  - **NBC C2**
  - **Coordinate Coalition Warfare**
  - **Defensive nuclear and biological warfare**
  - **Offensive NBC warfare**
  - **Conduct demonstration and deception**
  - **SOF anti-ship operations**
  - **Counter space operations**
  - **Dynamic retasking of aircraft (within ATO)**
  - **C2 reconstitution**
  - **Information warfare**
  - **Airspace control**
  - **Stand-alone SHORAD**
  - **Positive identification of forces**
  - **Rear area security**
  - **Theater-level EMCON conditions**
  - **Non-combatant Evacuation Operations**
  - **Personnel recovery**

* **Release 3 threshold has yet to be specified**

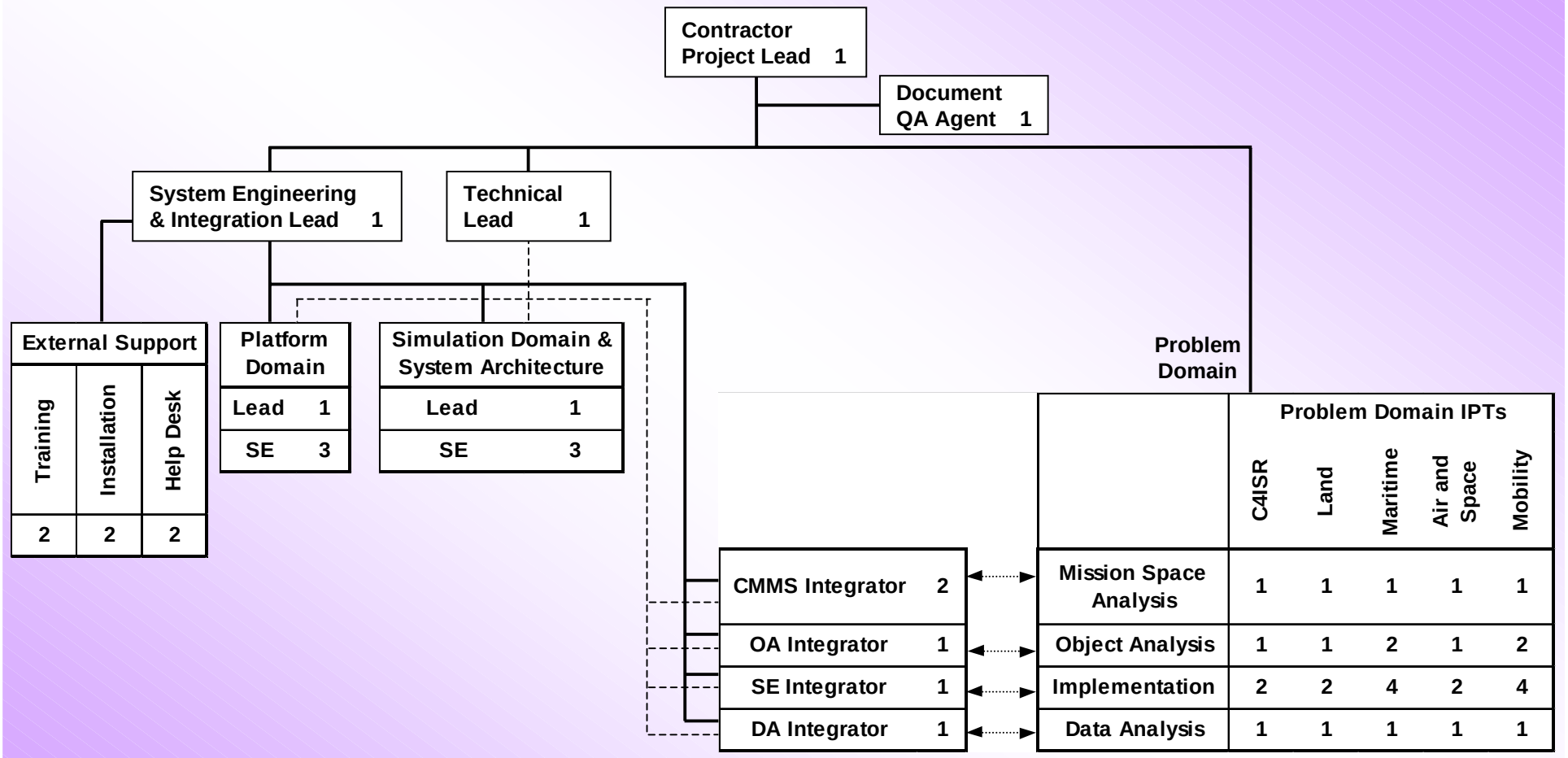
Participating Organizations

JWARS Office

Integrated Government-Contractor Office (Arlington, VA)



JWARS Development and Data Contractor Team



Key:

CMMS	Conceptual Model of the Mission Space
DA	Data Analyst
IPT	Integrated Product Team
OA	Object Analyst
QA	Quality Assurance
SE	Software Engineer

Computer & Admin Support

Computer Support	*(5)*
Administration & Facilities	*(5)*

Collaborative Development Process

Activity	Participants																		
	JWARS Office	Joint Data Support	JS/J-8	ODPA&E	DOT&E	Other OSD [1]	U.S. Air Force	U.S. Army	U.S. Navy	U.S. Marine Corps	JS/J-4	JS/J-2 & J-6	DIA & Intell Ctrs	DISA	USSOCOM	Other CINC Test Sites [2]	Other CINCs [3]	V&V Agent
Requirements Definition (ORD)	√		*L*	√			√	√	√	√	√	√	√		√	√	√	
Derived Requirements (JAD)	*L*	√	√	√			√	√	√	√	√	√	√	√	√	√	√	√
Design & Implementation	*L*	√	√	√			√	√	√	√	√	√	√	√	√	√	√	
Verification & Validation	√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	*L*
Alpha User Evaluation	*L*		√	√			√	√	√	√	√	√			√	√		
Test & Evaluation	√	√	√	√	√		√	*L*	√	√					√	√		
Data Development	√	*L*	√	√			√	√	√	√	√	√	√	√	√	√	√	
Training and Installation	*L*	√	*L*	√			√	√	√	√	√				√	√	√	
Configuration Management	√		*L*	√			√	√	√	√	√				√	√	√	
Management Guidance (Steering Committee)			√	*L*	√	√	√	√	√	√	√	√	√	√	√			

Notes
1. "Other OSD" includes DASD(R&P)/OUSD(P), DMSO/OUSD(A&T), API/OUSD(A&T), TSE&E/OUSD(A&T), and ASD(C3I).
2. "Other CINC Test Sites" are USCENTCOM, USTRANSCOM, USPACOM, and USFK.
3. "Other CINCs" include USSPACECOM, USEUCOM, USSTRATCOM, USSOUTHCOM, and USACOM.

Key: *L* = lead; √ = participate in, contribute to

Significant contributions from all participants

V&V and T&E Oversight
Working Integrated Product Team

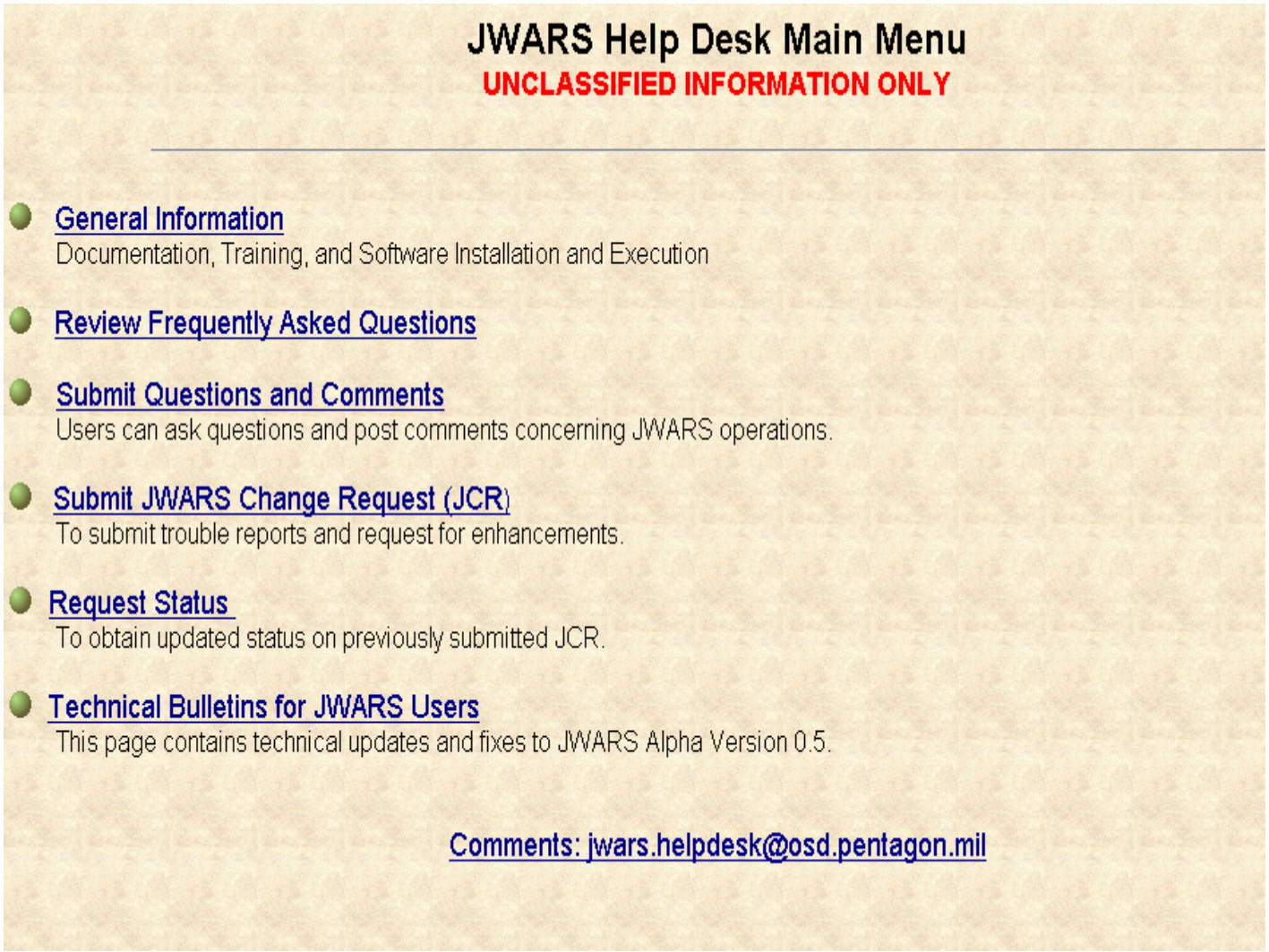
- **Roles**
  - **Define V&V and T&E strategy.**
  - **Identify and coordinate V&V and T&E activities.**
  - **Identify evaluation requirements.**
  - **Identify resource and support requirements.**
  - **Determine appropriate documentation.**
  - **Provide advice on V&V and T&E activities to JAMIP Steering Committee.**
- **Membership - representatives of**
  - **JWARS Office**
  - **Joint Data Support Organization**
  - **JWARS V&V Agent**
  - **Test sites (12)**
  - **Services' Operational Test Agencies**
  - **Director, Operational Test and Evaluation (DOT&E)**
  - **Defense Modeling and Simulation Office (DMSO)**
  - **Joint Staff/J-8/SAMD**
  - **Institute for Defense Analyses (IDA)**

Coordination via Internet

- **JWARS Primary Web Site**
  - **Site address: http:/www.dtic.mil/jwars/**
  - **Access control: unlimited**
  - **Purpose: General information and publications**
  - **E-mail address for comments: jwars@osd.pentagon.mil**
- **JWARS Users' Group Web Site**
  - **Site address: https://ca.dtic.mil/j-u-g96/**
  - **Access control: user ID and password**
  - **Purposes**
    - **Coordination with users and subject matter experts**
    - **Help Desk support**
- **JWARS Working Integrated Product Team Web Site**
  - **Site address: https://ca.dtic.mil/vvte.html**
  - **Access control: user ID and password**
  - **Purpose: Coordination with V&V and T&E oversight group**

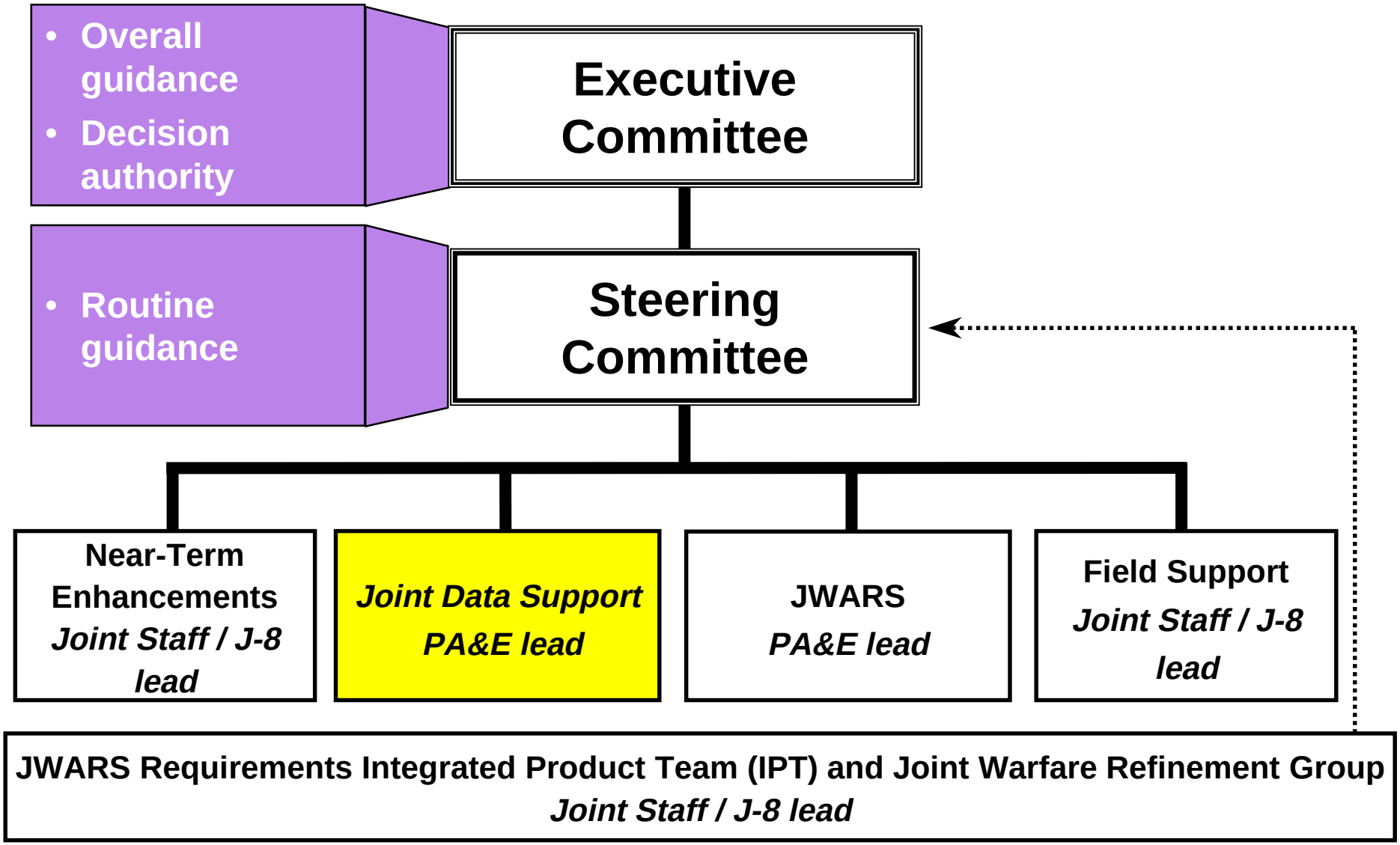
Help Desk Home Page

- **Access**
  - **Enter through JWARS Users' Group Web Site: http:/www.dtic.mil/jwars/ (plus user ID and password)**
  - **Then select "Help Desk"**
- **Main Page**



Joint Data Support (JDS)

JAMIP Organization and Management Structure



Joint Data Support (JDS)

- **Objectives**
  - **Improve quality of data used in DoD studies**
  - **Allow study teams to focus on analysis**
  - **Reduce simulation set up time**
- **Approach**
  - **Participate in study plan and scenario development**
  - **Draw and integrate data from appropriate Services and intelligence sources**
  - **Ensure data quality**
  - **Tailor source data to study**
- **Status: Currently supporting several force-level studies and JWARS development**

More information on JDS is available in a separate briefing on JWARS Web Site.

JDS Role in JWARS Development

- **Assess model development methodologies and data source environment to ensure:**
  - **Algorithms being implemented are supportable with available data**
  - **Appropriate feeder models/preprocessors are available**
  - **Data development resources are defined**
- **Provide data required for development to include:**
  - **Scenario data**
  - **Systems performance and characteristics**
  - **Combat adjudication tables**
  - **Behaviors and associated decision rule sets**

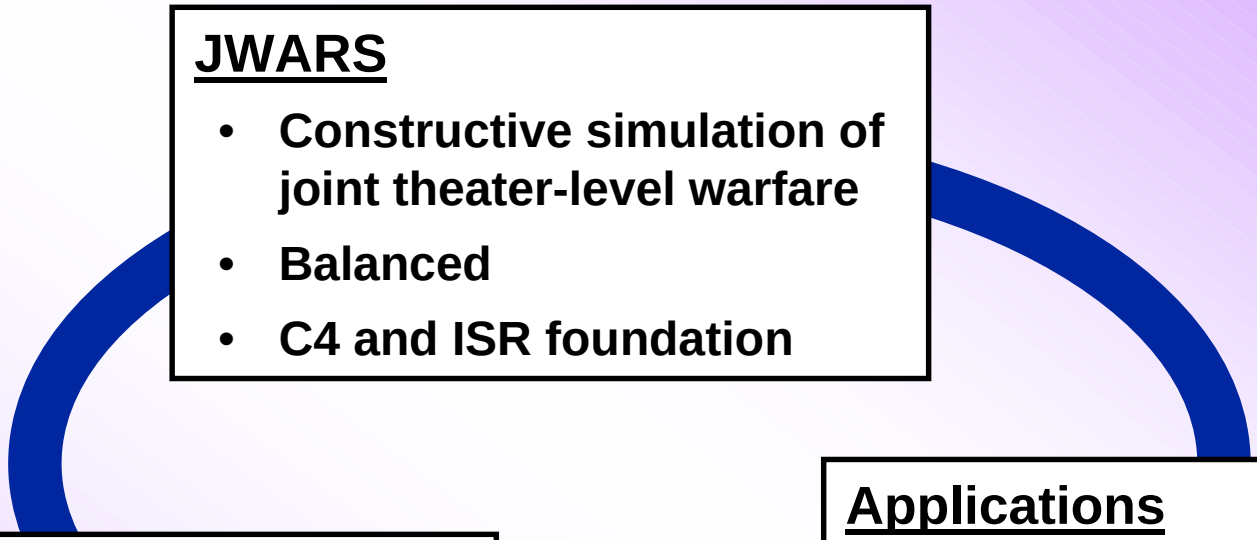
More information on JDS is available in a separate briefing on JWARS Web Site.

JDS Role in JWARS Test & Evaluation and Fielding

- **Design Relational Database Management System (RDBMS) to respond to JWARS queries**
  - **Develop JWARS Battle Space Entity (BSE) data templates**
  - **Design and implement logical and physical databases to meet JWARS data specifications**
- **Develop Scenario data to support:**
  - **Developer Acceptance Testing**
  - **Beta Testing, and Operational Test and Evaluation**
  - **Baseline scenarios to support initial model fielding**

More information on JDS is available in a separate briefing on JWARS Web Site.

JWARS Payoff - Improved Analytic Support



JWARS

- Constructive simulation of joint theater-level warfare
- Balanced
- C4 and ISR foundation

Users

- Joint Staff
- Services
- CINCs
- OSD
- Joint Task Forces
- Other DoD organizations
- Industry

Applications

1. Force assessment
2. Planning and execution
   - Deliberate planning
   - Crisis action planning
3. System effectiveness and trade off analysis
4. Concept and doctrine development and assessment

Acronyms and Abbreviations
(page 1 of 8)

Acronym/Abbreviation	Definition
ACO	Air Control Order
ACOM	United States Atlantic Command
AFSAA	Air Force Studies and Analysis Agency
AMG	Architecture Management Group
AOA	Avenue of Approach
AOI	Area of Interest
API	Acquisition Program Integration or Application Program Interface
ASD	Assistant Secretary of Defense
AT	Acceptance Test
ATO	Air Tasking Order
AWACS	Airborne Warning And Control System
BDA	Battle Damage Assessment
BMDO	Ballistic Missile Defense Organization
BMH/IMC	BMH Associates-Innovative Management Concepts
BSE	BattleSpace Entity
BU	back up
C2	command and control
C3	command, control, and communications
C3I	C3 and intelligence
C4	command, control, communications, and computers
C4I	C4 and intelligence
C4ISR	C4 and ISR
CAA	Center for Army Analysis
CAP	Combat Air Patrol
CAS	Close Air Support
CCB	Configuration Control Board
CCIR	Commander's critical intelligence requirement
CEM	Concepts Evaluation Model
CENTCOM	United States Central Command
CFC	Combined Forces Command
CFDB	Conventional Forces Database
CI	configuration item
CINC	Commander-in-Chief
CISA	C4I Integration Support Activity

Acronyms and Abbreviations
(page 2 of 8)

Acronym/Abbreviation	Definition
CJCS	Chairman, Joint Chiefs of Staff
CJTF	Commander, Joint Task Force
CM	Configuration Management
CMMS	Conceptual Model of the Mission Space
CNA	Center for Naval Analysis
CNO	Chief of Naval Operations
COA	course of action
COMINT	communications intelligence
CONLAN	Contingency Plan
COSAGE	Combat Sample Generator
CR	Change Request
CS	Combat Support
CSC	computer software component
CSCI	computer software configuration item
CSS	Combat Service Support
DA	Direct Action or Development Agent
DASD	Deputy Assistant Secretary of Defense
DAWMS	Deep Attack Weapons Mix Study
DCA	Defensive Counter Air
DD	Deputy Director or Detailed Design
DEEM	Dynamic Environmental Effects Model
DIA	Defense Intelligence Agency
DISA	Defense Information Systems Agency
DMSO	Defense Modeling and Simulation Office
DoD	Department of Defense
DoDD	DoD Directive
DPA&E	Director, Program Analysis and Evaluation
DPG	Defense Planning Guidance
DR&E	Defense Research and Engineering
DSB	Defense Science Board
DSP	Defense Satellite Program
DSWA	Defense Special Weapons Agency
DUSA(OR)	Deputy Under Secretary of the Army (Operations Research)
EA	Executive Agent

Acronyms and Abbreviations
(page 3 of 8)

Acronym/Abbreviation	Definition
EADSIM	Extended Air Defense Simulation
EEA	essential element of analysis
EEI	essential element of information
ELINT	electronic intelligence
EM	Enterprise Model
EMFL	Experiment in Modeling Focused Logistics
EO	Electro-Optical
ETD	event trace diagram
EUCOM	United States European Command
EXCOM	Executive Committee
FOC	Full Operational Capability
FOM	Federation Object Model
FY	fiscal year
GUI	graphical user interface
HCI	Human Computer Interface
HLA	High-Level Architecture
HLD	High Level Design
HNS	Host Nation Support
HPT	high payoff target
HQ	headquarters
HQDA	Headquarters, Department of the Army
HUMINT	human intelligence
HVT	high value target
HWCI	hardware configuration item
I/F	interface
ID	identify or identification
ID/IQ	indefinite delivery/indefinite quantity
IDA	Institute for Defense Analyses
IIPT	Integration Integrated Product Team
IMINT	image intelligence
IOC	Initial Operational Capability
IPB	Intelligence Preparation of the Battlespace
IPR	in progress review
IPS	Illustrative Planning Scenario

Acronyms and Abbreviations
(page 4 of 8)

Acronym/Abbreviation	Definition
IPT	Integrated Product Team
IR	infrared
ISR	intelligence, surveillance, and reconnaissance
ITEM	Integrated Theater Engagement Model
J-4	Joint Staff Director for Logistics
J-8	Joint Staff Director for Force Structure, Resources and Assessment
JACS	JWARS Administrative Control System
JAD	Joint Application Design
JAMIP	Joint Analytic Model Improvement Program
JAST	Joint Advanced Strike Technology
JCMMS	Joint Conceptual Model of the Mission Space
JDS	Joint Data Support
JFACC	Joint Force Air Component Command
JFLCC	Joint Force Land Component Command
JFMCC	Joint Force Maritime Component Command
JHU/APL	Johns Hopkins University / Applied Physics Laboratory
JIC	Joint Intelligence Center
JICM	Joint Integrated Contingency Model
JIPB	Joint Intelligence Preparation of the Battlespace
JLOTS	Joint Logistics Over The Shore
JM&SRG	Joint Modeling and Simulation Requirements Group
JOA	Joint Operations Area
JRB	JROC Review Board
JROC	Joint Requirements Oversight Council
JSC	Joint Spectrum Center
JSIMS	Joint Simulation System
JTCB	Joint Targeting Control Board
JTF	Joint Task Force
JTMD	Joint Theater Missile Defense
JV	Joint Vision
JWARG	Joint Warfare Refinement Group
JWARS	Joint Warfare System
JWCM	JWARS Configuration Manager
KPP	key performance parameter

Acronyms and Abbreviations
(page 5 of 8)

Acronym/Abbreviation	Definition
LCM	Life Cycle Model
LMI	Logistics Management Institute
M&S	modeling and simulation
MASINT	measurements and signature intelligence
MCCDC	Marine Corps Combat Development Command
MEF	Marine Expeditionary Force
MIDAS	Model for Intertheater Deployment by Air and Sea
MOA	memorandum of agreement
MOE	measure of effectiveness
MOG	maximum on ground
MOP	measure of performance
MOPP	military operational protective posture
MORS	Military Operations Research Society
MSA	mission space analysis or mission space analyst
MRS	Mobility Requirements Study
MRS BURU	Mobility Requirements Study Bottom Up Review Update
MTI	Moving Target Indicator
MTW	Major Theater War
NAI	named area of interest
NBC	nuclear, biological, and chemical
NEA	Northeast Asia
NPS	United States Naval Postgraduate School
NSA	National Security Agency
O&M	operations and maintenance
O&S	operations and support
OA	object analysis or object analyst
OCA	Offensive Counter Air
ODPA&E	Office of the Director, Program Analysis and Evaluation
OMT	Object Model Template
OID	object interaction diagram
OIPT	Overarching Integrated Product Team
OOTW	operations other than war
OP	Operational
OPTEC	U.S. Army Operational Test and Evaluation Command

Acronyms and Abbreviations
(page 6 of 8)

Acronym/Abbreviation	Definition
ORD	Operational Requirements Document
OSD	Office of the Secretary of Defense
OT	operational test
OT&E	Operational Test and Evaluation
OTA	Operational Test Agent
PA&E	Program Analysis and Evaluation
PACOM	United States Pacific Command
PDM	Program Decision Memorandum
PIR	priority intelligence requirement
PM	Project Manager or Program Manager
POD	Port of Debarkation
POE	Port of Embarkation or Posture of Engagement
POM	Program Objective Memorandum
PreJ	Pre-JROC
PSYOPS	psychological operations
QDR	Quadrennial Defense Review
RDBMS	Relational Database Management System
RDD	Required Delivery Date
RDT&E	research, development, test, and evaluation
RF	radio frequency
RGP	Regional Greater Power
RSOI	Reception, Staging, and Onward Movement
RTI	Runtime Infrastructure
S&R	Strategy and Requirements
S/W	software
SAM	surface-to-air missile
SAMD	Studies and Analysis Management Division
SC	Steering Committee
SCM	Software Configuration Management
SE	software engineer
SHORAD	SHOrt Range Air Defense
SLOC	Sea Lines of Communications
SME	subject matter expert
SN	Strategic National

Acronyms and Abbreviations
(page 7 of 8)

Acronym/Abbreviation	Definition
SOCOM	United States Special Operations Command
SOF	Special Operations Forces
SOM	Simulation Object Model
SOUTHCOM	United States Southern Command
SPA	Strategic Plans and Analysis
SPACECOM	United States Space Command
SSC	Smaller Scale Contingency
ST	Strategic Theater
STRATCOM	United States Strategic Command
SUMMITS	Scenario Unrestricted Mobility Model for Intratheater Simulation
SUW	Surface Warfare
SWA	Southwest Asia
T&E	test and evaluation
TA&P	Theater Assessments and Planning
TACWAR	Tactical Warfare Simulation
TAI	targeted area of interest
TAOS	Total Atmospheric and Oceanic Server
TC	Test Conductor
TD	Test Director
TEL	Transporter-Erector-Launcher
TIE	TACWAR Integrated Environment
TLAM	Tomahawk Land Attack Missile
TMD	Theater Missile Defense
TPFDD	Time-Phased Force Deployment Data
TRAC	United States Army Training and Doctrine Command Analysis Center
TRADOC	United States Army Training and Doctrine Command
TRANSCOM	United States Transportation Command
TSE&E	Test Systems Engineering and Evaluation
U. S.	United States
UJTL	Universal Joint Task List
USA	United States Army
USAF	United States Air Force
USD	Under Secretary of Defense
USMC	United States Marine Corps

Acronyms and Abbreviations
(page 8 of 8)

Acronym/Abbreviation	Definition
USN	United States Navy
USW	Under Sea Warfare
V&V	verification and validation
V,V&C	verification, validation, and certification
VCJCS	Vice Chairman, Joint Chiefs of Staff
VIC	Vector-in-Commander simulation
VISA	Voluntary Intermodal Sealift Agreement
WAD	Warfighting Analysis Division
WIPT	Working Integrated Product Team
WMD	Weapons of Mass Destruction
WSA	Wargaming, Simulation, and Analysis